Red Hill Administrative Order of Consent (AOC) Scoping Meetings Statement of Work (SOW) Section 6 and 7

November 30, 2015 – December 3, 2015
Building 679, Navy College, SUBASE Area,
Joint Base Pearl Harbor-Hickam, Hawaii

1. Overall Meeting Objective

Discuss technical approach, design, and rationale for AOC SOW Section 6 (Investigation and Remediation of Releases), Section 7.1 (Groundwater Flow Model), Section 7.2 (Contaminant Fate and Transport [CF&T] Model), and Section 7.3 (Groundwater Monitoring Network) for the Red Hill Bulk Fuel Storage Facility.

2. Draft Agenda Overview (Detailed Draft Agenda Attached)

Day 1 – Monday, November 30, 2015

0800 – 1000	Introduction of Attendees, Meeting Procedures, and All-Tracks Discussion
1000 – 1015	Break; Separate into Different Meeting Track (Section 6 and Section 7)
1015 – 1045	Introductions, Review Meeting Agenda, and State AOC SOW Section Purposes
1045 – 1130	Site Setting: Land Uses, Topography, Water Resources, Regional Geology
1130 – 1230	Lunch
1230 – 1430	Site Hydrogeology: Preliminary Geologic Conceptual Site Model (CSM)
1430 – 1445	Break
1445 – 1700	Previous Investigations (Pre-2014): Results, Existing Models and CSM

Day 2 – Tuesday, December 1, 2015

0800 – 1030	January 2014 Release: Response, Investigations, and Results
1030 – 1045	Break
1045 – 1200	*AOC SOW Section 6 In-Depth Discussion: Objectives and Tasks*
1200 – 1300	Lunch
1300 – 1400	Task #1: Evaluate Vadose Zone Geology
1400 – 1500	Task #2: Investigate Light Non-Aqueous Phase Liquid (LNAPL)
1500 – 1515	Break
1515 – 1600	Task #2: Investigate LNAPL (Continued)
1600 – 1700	Task #3: Identify Chemicals of Potential Concern (COPCs)

Day 3 – Wednesday, December 2, 2015

0800 – 0900	All-Tracks Discussion on Progress
0900 – 1030	Section 6 Task #4: Monitoring Network – Existing and Newly Proposed
1030 – 1045	Break
1045 – 1200	Task #4: Monitoring Network (Continued)
1200 – 1300	Lunch
1300 – 1500	Task #4: Monitoring Network (Continued)
1500 – 1515	Break
1515 – 1615	*AOC SOW Section 7 In-Depth Discussion: Objectives and Tasks*
1615 – 1700	Task #5: Update the Existing Groundwater Model

Day 4 – Thursday, December 3, 2015

0800 – 1000	Task #5: Update the Existing Groundwater Model (Continued)
1000 – 1015	Break
1015 – 1200	Task #6: Update CF&T Model and Evaluate Whether to Perform a Tracer Study
1200 – 1300	Lunch
1300 – 1400	Task #7: Evaluate Potential Remedial Alternatives – Feasibility, Methodologies
1400 – 1500	Open Discussion
1500 – 1515	Break
1515 – 1630	Path Forward, Milestones, Potential Collaboration, and Review Action Items

Day 5 – Friday, December 4, 2015

0800 – 0900	All-Tracks Discussion and Closeout
0900 – TBD	[Contingent if Section 6 and Section 7 Require More Discussions]

3. DRAFT DETAILED MEETING AGENDA

Day 1 – Monday, November 30, 2015

0800 – 1000 Introduction of Attendees, Meeting Procedures, and All-Tracks Discussion

1000 – 1015 Break; Separate into Different Meeting Track (Section 6 and Section 7)

1015 – 1045 Introductions, Review Meeting Agenda, and State AOC SOW Section Purposes

- Introductions

- AOC SOW Section 6 Objective
  a. "Determine the feasibility of alternatives for investigating and remediating releases from the Facility" including:
     i. "…the response to the January 2014 release from Tank #5 and an evaluation and discussion of potential remediation methods for the January 2014 Tank #5 release and any future releases"

- AOC SOW Section 7 Objective
  a. "Monitor and characterize the flow of groundwater around the Facility"
  b. "Update the existing Groundwater Protection Plan (GPP) to include response procedures and trigger points in the event that contamination from the Facility shows movement toward any drinking water well"

- Section 6 and Section 7 Scoping Meeting Objectives
  a. General
     i. Understand site history, conditions, environment, limitations, and challenges
     ii. Review existing data and models; identify data gaps and other needs
     iii. Come to an understanding of what is and is not feasible
  b. Specific
     i. Outline major tasks that can achieve the AOC-SOW objectives
     ii. Discuss framework and criteria to be used in implementing the major tasks
     iii. Discuss potential investigation and analysis details
        - Details will be finalized in the Scopes of Work (Workplans) for each AOC-SOW Section, that will be developed upon regulators' acceptance of the Final Scoping Meeting

1045 – 1130 Site Setting: Land Uses, Topography, Water Resources, Regional Geology

- Facility Description and History

- Location and Setting
  a. Surrounding land use and other potential point sources
  b. Topography, surface water, and surface soils
  c. Regional groundwater supply wells: Red Hill, Halawa, Moanalua

1130 – 1230 Lunch

1230 – 1430 Site Hydrogeology: Preliminary Geologic Conceptual Site Model CSM)

- Vadose Zone Geology
  a. Hawaiian lava flows and geologic features and properties
  b. Pahoehoe, a'a, clinker, tuff, dikes and sills, strike and dip of flow bedding/planes
  c. Permeability, confining layers, voids, flow directions
  d. Previous Red Hill investigations: boring logs and rock cores

- Preliminary Geologic CSM of the Vadose Zone Underlying the Facility

1430 – 1445 Break

1445 – 1700 Previous Investigations (Pre-2014): Results, Existing Models and CSM

- Summary of Previous Investigations

- Releases and Development of Existing Groundwater Monitoring Well Network
  a. Well construction details

- Boring Logs and Rock Cores – Aquifer Substrate Composition

- Results of Previous Investigations – Environmental Sampling and Analysis
  a. Water level and LNAPL gauging
  b. Groundwater sampling and laboratory chemical analysis
  c. Soil vapor results

- Groundwater Flow Model
  a. Limitations data gaps, and opportunities for improvement

- Contaminant Fate and Transport (CF&T) Model
  a. Limitations data gaps, and opportunities for improvement

Day 2 – Tuesday, December 1, 2015

0800 – 1030 January 2014 Release: Response, Investigations, and Results

- Release Points, Detection, Fuel Type, and Quantity
  a. Review of any available information

- Response and Investigations
  a. Installations of new monitoring wells (RHMW06 and RHMW07)
  b. Vadose zone evaluation
  c. Soil vapor results

- Environmental Sampling and Analysis
  a. Chemicals of potential concern (COPCs)

1030 – 1045 Break

1045 – 1200 *AOC SOW Section 6 In-Depth Discussion: Objectives and Tasks*

- Overall AOC SOW Section 6 Objective
  a. "Determine the feasibility of alternatives for investigating and remediating releases from the Facility"

- Major Tasks to Achieve Section 6 Objective
  a. Task #1: Evaluate Vadose Zone Geology
  b. Task #2: Investigation Light Non-Aqueous Phase Liquid (LNAPL)
  c. Task #3: Identify Chemicals of Potential Concern (COPCs)
  d. Task #4: Monitoring Network – Existing and Newly Proposed

1200 – 1300 Lunch

1300 – 1400 Task #1: Evaluate Vadose Zone Geology

- Geologic Mapping
  a. Previous boring logs and rock cores
  b. Aerial imagery
  c. Field mapping
- Mapping to Strategically Place New Monitoring Wells (Discussed Further Below)
  a. Acquire additional information from the advancement of new borings/wells

1400 – 1500 Task #2: Investigate Light Non-Aqueous Phase Liquid (LNAPL)

- Brief Review of Geologic CSM: Constraints, Potential Inhibitors, and Objectives
  a. Subsurface heterogeneity, combined with interbedded voids and confining layers, potentially:
     i. LNAPL difficult to locate if within unpredictable void spaces
     ii. Difficult to remediate or remove
        - Natural attenuation would be expected to occur
     iii. Retards flow of LNAPL to groundwater (i.e., potential risk of drilling)

1500 – 1515 Break

1515 – 1600 Task #2: Investigate LNAPL (Continued)

- Consider Vadose Zone Vapor Transport Modeling
  a. Utilize existing soil vapor data
  b. Evaluate its use as leak detection (e.g., concentrations did not exceed immediately after the leak, level of protectiveness, etc.)

- Potential Non-Intrusive Technologies
  a. Electroresistivity methods
  b. Other geophysical techniques (i.e., MIP, LIF, UVOSS, etc.)
  c. Applicability and practicality of available methods
  d. To be evaluated in greater detail during preparation of scope of work

1600 – 1700 Task #3: Identify Chemicals of Potential Concern (COPCs)

- Review of Existing Data
- Identify COPCs
- Recommend COPCs For:
  a. Analytical testing
  b. Parameter inputs into CF&T model
- Sampling and Chemical Analyses Methods: Field and Laboratory

Day 3 – Wednesday, December 2, 2015

0800 – 0900 All-Tracks Discussion on Progress

0900 – 1030 Section 6 Task #4: Monitoring Network – Existing and Newly Proposed

- Well Placement Objectives:
  a. Addressing groundwater flow model data gaps –
     i. Evaluate the potential regional flow north and mauka of the prison, as indicated in the second modeling report from 2010
     ii. Evaluate the resistance to flow provided by the valley fill
     iii. Refine modeling boundary condition assumptions
  b. Addressing CF&T model data gaps (and potentially addressing future releases) –
     i. Consider installing sentinel wells between the release and the Halawa Shaft
     ii. Consider installing sentinel wells between the release and the Moanalua wells
     iii. Consider additional sentinel wells upgradient of the Red Hill Shaft
     iv. Consider sentinel well upgradient of the nearby (downgradient) housing
  c. Evaluate distribution of natural attenuation parameters
  d. Evaluate aquifer properties and refine geological profiles and model inputs
     i. Borehole logging, geotechnical soil sampling and testing, and potential geophysical methods (if found feasible)
     ii. Investigate the extent weathered basalt/saprolite layer that was recommended to be added and considered to the groundwater flow model
     iii. Better information on the valley fill and its potential effects
  e. Potential remedial alternatives and future use
     i. Recovery and treatment
     ii. Bioaugmentation (i.e., bioventing, etc.)
     iii. Expand monitoring network to include new and existing well locations

1030 – 1045 Break

1045 – 1200 Task #4: Monitoring Network (Continued)

- Potential Well Placement
  a. Consider northwest of Halawa Prison
  b. Consider south of Halawa Industrial Park
  c. Consider south of the Facility

1200 – 1300 Lunch

1300 – 1500 Task #4: Monitoring Network (Continued)

- Potential Well Placement (Continued Discussion)

- Well Construction Details
  a. Consider potential data use, representativeness, and future use (i.e., extraction, etc.)

1500 – 1515 Break

1515 – 1615 *AOC SOW Section 7 In-Depth Discussion: Objectives and Tasks*

- Overall AOC-SOW Section 7 Objective
  a. "Monitor and characterize the flow of groundwater around the Facility"
  b. "Update the existing Groundwater Protection Plan to include response procedures and trigger points in the event that contamination from the Facility shows movement toward any drinking water well"

- Major Tasks to Achieve Section 7 Objective (Interconnected to Section 6)
  a. Task #5: Update the Existing Groundwater Model
  b. Task #6: Evaluate Whether to Perform a Tracer Study
  c. Task #7: Evaluate Potential Remedial Alternatives – Feasibility, Methodologies

1615 – 1700 Task #5: Update the Existing Groundwater Model

- Strengths and Limitations of Mathematical Modeling of Red Hill
  a. MODFLOW & RT3D are state of the art flow and transport models that are particularly suitable for modeling petroleum releases in porous media
  b. Much effort has been expended to create a robust model, which can be improved and used
  c. The site aquifer substrate is likely amenable to equivalent porous flow modeling
  d. A model is only as good as its inputs (i.e., site characterization). The heterogeneity of Red Hill imposes inherent limitations to any mathematical model

- Other Modeling Programs and Considerations
  a. Freshwater flow only
  b. Density dependent flow
  c. Desktop Catchment Water Modeling

- Proposed Uses of the Mathematical Model
  a. Evaluate placement of new wells
  b. Set and revise site-specific risk based levels (SSRBLs)
  c. Evaluating potential remediation alternatives and develop contingency plans
  d. Provide input to and support the Risk and Vulnerability Assessment (AOC SOW Section 8) for hypothetical scenario considerations

Day 4 – Thursday, December 3, 2015

0800 – 1000 Task #5: Update the Existing Groundwater Model (Continued)

- Recommended Modeling Efforts
  a. Extent of groundwater flow model
  b. Incorporate data obtained since 2010 and input other model improvements:
     i. Literature review to verify appropriateness of layer geotechnical parameters
     ii. New groundwater monitoring well logs (re-evaluate model layers)
     iii. Consider adding weathered basalt (saprolite) layer above basalt layer
     iv. Groundwater elevation gauging data
     v. Revised recharge data (re-evaluate model boundary conditions)
     vi. Potential well placement
  c. Incorporate new data obtained during implementation of previous Section 6 tasks
     i. Stratigraphy
     ii. Groundwater elevations
     iii. COPCs analyses
  d. Revise SSRBLs and update risk assessment
  e. Basis and consideration of modeling codes/types
  f. Scenarios to be evaluated
  g. Calibration/Validation of model

1000 – 1015 Break

1015 – 1200 Task #6: Update CF&T Model and Evaluate Whether to Perform a Tracer Study

- Update CF&T Model
  a. Use updated groundwater model (i.e., flow parameter inputs [velocity, direction, dispersion], etc.)
  b. Contaminant species to be evaluated in model
  c. Transport assumptions (i.e., solubility, etc.)
  d. Degradation evaluation and inputs
  e. Scenarios to be evaluated
  f. Other model considerations
  g. Calibration/Validation of model

- Applicability, Feasibility, and Appropriateness of Conducting a Tracer Study
  a. Valuable input into CF&T model
  b. Limitations to a tracer study (i.e., implementability, timeframe, etc.)
  c. Possible tracer study designs
  d. Improper design can potentially result in a very expensive (in cost and time) failure

1200 – 1300 Lunch

1300 – 1400 Task #7: Evaluate Potential Remedial Alternatives – Feasibility, Methodologies

- Evaluate and Recommend Remedial Alternatives Based on Results of Aforementioned Tasks

a. Evaluate remedial alternatives against the following criteria:
   i. Overall Protection of Human Health and the Environment
   ii. Compliance with Other Federal and State Requirements
   iii. Long-Term Effectiveness and Permanence
   iv. Reduction of Toxicity, Mobility, or Volume through Treatment
   v. Short-Term Effectiveness
   vi. Implementability
   vii. Cost
   viii. Projected State Acceptance
   ix. Project Community Acceptance

1400 – 1500 Open Discussion

1500 – 1515 Break

1515 – 1630 Path Forward, Schedule Milestones, and Review Action Items/Decision Points

- AOC SOW Schedule for Section 6 and Section 7
- Potential Collaboration Opportunities with the University of Hawaii on Section 6 and Section 7
- Additional Scoping Meetings Required?